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Filling the distribution gaps of two species of *Accipiter* Brisson, 1760 (Aves, Accipitriformes) in northeastern Brazil

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Abstract

We present new records of Gray-bellied Hawk, *Accipiter poliogaster* (Temminck, 1824), and Rufous-thighed Hawk, *A. striatus erythronemius* (Kaup, 1850), from northeastern Brazil and review the occurrence of these species in this region. While *A. s. erythronemius* occurs in secondary forests in the semi-arid regions of northeast Brazil, *A. poliogaster* seems to be associated more with mature and wet forests and not in the Caatinga scrub.

Key words

Accipitridae, *Accipiter poliogaster*, *Accipiter striatus erythronemius*, geographic range, Gray-bellied Hawk, Maranhão, Rufous-thighed Hawk.

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Introduction

The cosmopolitan family Accipitridae (hawks and eagles) includes 248 species, of which, 54 are threatened with extinction (Thiollay 2018). These diurnal raptors are found in all regions of the world except Antarctica and occupy practically all types of habitat, from forests to deserts and even urban areas (Brown and Amadon 1989).

Accipiter Brisson, 1760 is the largest accitripid genus (ca 50 species), and its members range in weight from 75 g, for a small male African Little Sparrowhawk, *Accipiter minullus* Daudin, 1800, to 1,400 g, for a large female Northern Goshawk, *Accipiter gentilis* (Linnaeus, 1758) (Thiollay 2018). Four *Accipiter* species occur in Brazil (Piacentini et al. 2015): Gray-bellied Hawk, *Accipiter poliogaster* (Temminck, 1824); Tiny Hawk, *A. superciliosus* (Linnaeus, 1766), Sharp-shinned Hawk, *A. striatus* Vieillot, 1908; and Bicolored Hawk, *A. bicolor* (Vieillot, 1817).

The Gray-bellied Hawk (*A. poliogaster*) occurs from Venezuela and the Guyanas to northern Argentina, including most of Brazil (Pinto 1978, Brown and Amadon 1989, Sick 1997, Thiollay 2018). Despite its ample distribution, records are scant and localized, and few specimens are preserved in museums (Lanzer et al. 2009). This hawk inhabits humid forests, generally in lowlands to 800 m a.s.l.; however, there are records from 1,800 m a.s.l. in southeastern Brazil and 1,950 m a.s.l. in

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eastern Ecuador. Little is known about the behavior of this species, and it is listed as Near Threatened by BirdLife International (2016).

The Sharp-shinned Hawk (*Accipiter striatus*) is one of the smallest raptors found in Brazil. It has a large, but discontinuous distribution between North America and Argentina, including northeastern, central, and southern Brazil (Sick 1997, BirdLife International 2016). The Brazilian subspecies, *A. s. erythronemius* (Kaup, 1850), which some authors consider to be a distinct species, Rufous-thighed Hawk, is found in a variety of forested habitats, mostly in relatively arid areas, and in semi-open areas such as arboreal savanna, as well as more humid forests, from sea-level to altitudes of approximately 1,000 m a.s.l. (White et al. 2018).

We present new records of the Rufous-thighed Hawk and the Gray-bellied Hawk from the Brazilian state of Maranhão and review the data available on the occurrence of the two species in the country's Northeast Region.

Methods

The records presented here were collected in the Inhamum Environmental Protection Area (Inhamum EPA) in the municipality of Caxias, in Maranhão, Brazil (04°53′30″ S, 043°24′53″ W). The Inhamum EPA covers an area of approximately 3,500 ha on the southern margin of the BR-316 federal highway. The predominant vegetation is typical of the Brazilian Cerrado savanna (sensu lato), with elements of the transition with Amazon forest in more humid areas near watercourses, and the more arid Caatinga scrub forest.

All available distributional data of the 2 study species were compiled from the literature and the ornithological collections of the following institutions: Museu Paraense Emílio Goeldi (MPEG; Belém, Brazil); Zoology Museum of the University of São Paulo (MZUSP; São Paulo, Brazil); National Museum (MNRJ; Rio de Janeiro, Brazil); American Museum of Natural History (AMNH; New York, USA); Field Museum of Natural History (FMNH; Chicago, USA); National Museum of Natural History, Smithsonian Institution (NMNH; Washington, DC, USA); Forschungsinstitut Senckenberg (SMF; Weimar, Germany); and Carnegie Museum of Natural History (CMNH; Pittsburgh), USA. Five online databases were also consulted: Web of Science (http://www.webofknowledge.com), WikiAves (http://www.wikiaves.com), Xeno-canto (http://www.xeno-canto.org), speciesLink (http://www.splink.cria.org.br), and GBIF (http://www.gbif.org). The maps were produced in QGIS v. 3.0.

Data Resources

The data underpinning the analysis reported in this paper are deposited at GBIF, the Global Biodiversity Information Facility, http://ipt.pensoft.net/resource?r=accipiter_ne_br.

Results

Gray-bellied Hawk, *Accipiter poliogaster*

New records. Brazil: Maranhão, Caxias, Inhamum EPA, gallery forest of the Inhamum stream (04°53′39″ S, 043°25′43″ W), 5 May 2017, 06:30 h, 1 individual perched on a dead tree at a height of 15 m (Fig. 1a). Brazil: Maranhão, Caxias, Inhamum EPA, transition area between cerrado and gallery forest (04°53′45″ S, 043°25′40″ W), 21 July 2017, vocalization recorded. Brazil: Maranhão, Caxias, Gameleira village, savana woodland (cerradão) (05°07′50″ S, 043°18′24″ W), 23 September 2017, 06:50 h, 1 individual, after being observed for 5 min, flew deeper into the woods (Fig. 1b; WA2710900). Brazil: Maranhão, Caxias, Malhada de Areia farm, savana woodland (cerradão) (04°52′37″ S, 043°30′06″ W), 14 October 2018, 06:23 h, 1 juvenile observed/photographed perched for a few seconds, then it flew into the woods (Fig. 1c).

Only 3 existing records of this species from the Brazilian Northeast were identified (Fig. 3, Table 1): an adult specimen collected by F. Schwanda in August 1910, in the municipality of Humberto de Campos, Maranhão (MPEG 7408); an adult female collected in 1944 in the municipality of Ilhéus, Bahia (MZUSP 32857); and undated specimen collected in the municipality of Salvador, Bahia (SMF 14191).

Rufous-thighed Hawk, *Accipiter striatus erythronemius*

New records. Brazil: Maranhão, Caxias, Inhamum EPA, gallery forest (04°53′14″ S, 043°25′30″ W), 1 December 2014, ca 11:00 h, 1 individual perched in a tree crown at a height of ca 20 m; it was photographed and monitored for a few minutes, but when it perceived the presence of the observers, it moved out of view into the dense vegetation of the crown. Brazil: Maranhão, Caxias, Inhamum EPA, Cerrado (sensu stricto) (04°53′32″ S, 043°25′17″ W), 14 February 2016, 11:30 h, 1 individual photographed (Fig. 2) and its voice recorded.

In the Brazilian Northeast, this species has been recorded in the states of Alagoas, Bahia, Ceará, Paraíba, Pernambuco, and Piauí (Table 1).

Identification. Adults of the Gray-bellied Hawk were identified by the black crown and back and 3 broad, gray bars on the white-tipped tail (Bierregaard et al. 2018). Juveniles were remarkably similar to adults of Ornate Hawk-Eagle, *Spizaetus ornatus* (Daudin, 1800), which is distinguished from Gray-bellied Hawk by being larger and having a longer crest and fully-feathered tarsi (Bierregaard et al. 2018). The Rufous-thighed Hawk was identified by its relatively small size, slender shape, rufous thighs, and underparts with rufous barring (White et al. 2018). In addition, we compared our recordings to audio recordings available from online databases (Xeno-canto, WikiAves) in order to confirm the identifications.

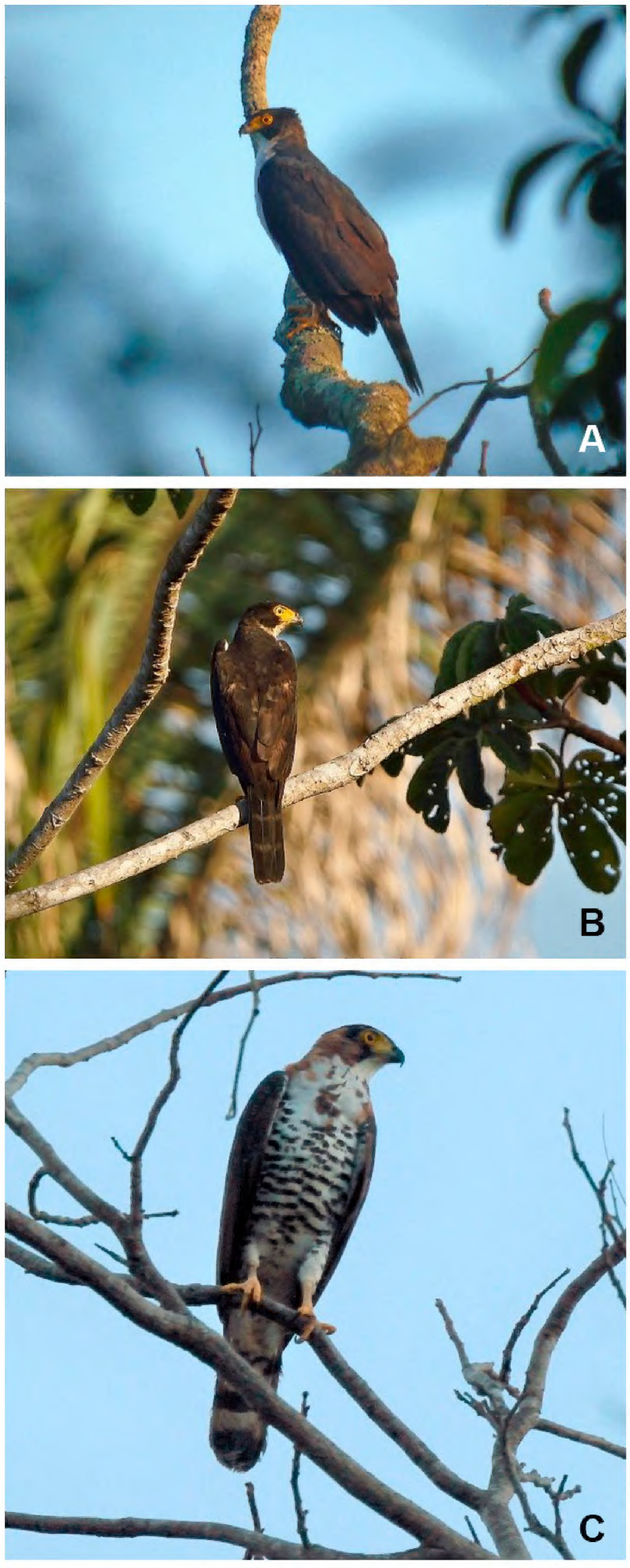

Figure 1. Adults and juvenile individuals of Gray-bellied Hawk (*Accipiter poliogaster*) recorded in (**a**) Inhamum EPA, (**b**) Gameleira village, and (**c**) Malhada de Areia farm, municipality of Caxias, Maranhão, Brazil. Photographed by HRSM (a), Firmino Filho (b), and FKU (c).

Discussion

Our records of *A. poliogaster* are only the second and third for the state of Maranhão (for the previous record, see Table 1 and Fig. 3 #1). These extends the range in Maranhão of this species by 250 km towards the south.

Figure 2. Rufous-thighed Hawk (*Accipiter striatus erythronemius*) recorded in the Inhamum EPA, municipality of Caxias, Maranhão, Brazil. Photographed by HRSM.

The only other records from the Brazilian Northeast are 1,200 km to the south and east in the Atlantic Forest of the state of Bahia (Fig. 3). There are no records whatsoever in the arid Caatinga biome. In contrast with *A. s. erythronemius*, *A. poliogaster* appears to depend on well-stratified, mature forests. Despite being the largest and most robust *Accipiter* species found in the Neotropics, its shy and elusive behavior, together with its low population densities, may contribute to the relative paucity of records available for this hawk (Pinto 1952, Sick 1997).

Our new records of *A. s. erythronemius* extend the known geographic distribution of this species in the Cerrado biome by approximately 350 km to the north and east; the nearest previously known locality is 300 km further northeast in the Caatinga biome. The data set compiled here indicates that *A. s. erythronemius* is amply distributed in the Brazilian Northeast, where it has been recorded in the Atlantic Forest, Caatinga, and Cerrado biomes. This species appears to be extremely versatile in its habitat use, inhabiting primary and secondary forests, edge habitats, savannas, and even urban areas that are sufficiently wooded (Sick 1997).

Studies of the geographic distribution of species are essential for the development of effective conservation strategies, as well as supporting biogeographic and ecological research (Piacentini et al. 2006). Occasional

Table 1. Records of the Gray-bellied Hawk (*Accipiter poliogaster*) and Rufous-thighed Hawk (*Accipiter striatus erythronemius*) in the Brazilian Northeast. Years of records are presented in ascending order. Only the oldest voucher is presented for the same locality if more are available. American Museum of Natural History (AMNH), Carnegie Museum of Natural History (CMNH), Museu Paraense Emílio Goeldi (MPEG), Museu de Zoologia da Universidade de São Paulo (MZUSP), Forschungsinstitut Senckenberg (SMF), WikiAves (WA), Xeno-canto (XC). * Unspecified localities were georeferenced at the municipality headquarters. M = museum specimens, P = photo, S = sound record.

Map #	Species	Year of record	Locality*	Municipality	State	Latitude (S)	Longitude (W)	Source	Voucher	Documentation
1	*A. poliogaster*	1910	Unspecified	Humberto de Campos	Maranhão	02°36′08″	043°27′49″	—	MPEG 7408	M
2		1944	Unspecified	Ilhéus	Bahia	14°47′36″	039°02′46″	—	MZUSP 32857	M
3		—	Unspecified	Salvador	Bahia	12°58′19″	038°30′05″	—	SMF 14191	M
4	*A. striatus*	1903	Unspecified	Lamarão	Bahia	11°47′37″	038°53′00″	—	AMNH 470468	M
5	*erythronemius*	1908	Vila Nova	Senhor do Bonfim	Bahia	10°27′35″	040°11′14″	Pinto 1938	MZUSP 7618	M
6		1958	Rio Preto	Santa Rita de Cássia	Bahia	11°00′15″	044°57′44″	GBIF	CMNH 31367	M
7		1958	Unspecified	Buritirama/Barra	Bahia	11°05′30″	043°08′22″	—	MZUSP 40761	M
8		1971	Fazenda Campos Bons	Mirandiba	Pernambuco	08°17′24″	038°34′48″	—	MZUSP 63287	M
9		1991	Barra Nova	Tauá	Ceará	05°33′00″	040°05′00″	Pacheco and Whitney 1995	—	—
10		2009	Boqueirão da Onça	Sento Sé	Bahia	09°59′38″	041°45′15″	WikiAves	WA52186	P
11		2009	Boqueirão da Onça	Campo Formoso	Bahia	10°00′03″	041°04′32″	Schunck et al. 2012, WikiAves	WA3106309	P
12		2010	Raso da Catarina	Canudos	Bahia	09°40′22″	038°40′19″	WikiAves	WA100810	P
13		2010	Povoado de São Matias	São Desidério	Bahia	12°21′07″	044°57′02″	WikiAves	WA795507	P
14		2011	Unspecified	Trindade	Pernambuco	07°48′00″	040°20′00″	Pereira et al. 2012	—	—
15		2012	Unspecified	Custódia	Pernambuco	08°05′13″	037°38′25″	Kaminski et al. 2013	—	—
16		2012	Várzea do Jiló	Ipu	Ceará	04°20′35″	040°44′43″	WikiAves	WA634201	P
17		2013	Unspecified	Pão de Açúcar	Alagoas	09°43′57″	037°26′06″	Xeno-canto	XC127168	S
18		2015	Unspecified	Lençóis	Bahia	12°33′42″	041°23′23″	WikiAves	WA1828649	P
19		2015	Unspecified	Meruoca	Ceará	03°32′30″	040°27′16″	WikiAves	WA1908660	P
20		2015	Unspecified	Boa Nova	Bahia	14°22′03″	040°12′24″	WikiAves	WA1928931	P
21		2016	Unspecified	Tianguá	Ceará	03°43′48″	040°59′33″	WikiAves	WA2072783	P
22		2016	Unspecified	Poções	Bahia	14°31′25″	040°21′49″	WikiAves	WA2286332	P
23		2016	Unspecified	Aguiar	Paraíba	07°05′37″	038°10′17″	WikiAves	WA2337403	P
24		2016	Juatama	Quixadá	Ceará	05°04′46″	039°02′12″	WikiAves	WA1990234	S
25		2017	Riacho da Volta	Ribeiro Gonçalves	Piauí	07°46′01″	045°01′00″	WikiAves	WA2680194	P
26		2017	Fazenda Caraíbas	Mucugê	Bahia	13°09′00″	041°24′00″	Freitas et al. 2016, WikiAves	WA2530172	P
27		2017	unspecified	Olho d'Água das Flores	Alagoas	09°31′55″	037°17′41″	WikiAves	WA2448996	P
28		2017	Fazenda Cantinho	Pio IX	Piauí	06°50′10″	040°36′47″	WikiAves	WA2828576	P
29		2018	Unspecified	Baraúna	Rio Grande do Norte	05°04′44″	037°37′02″	WikiAves	WA2932994	S
30		2018	Serra de Santana	Lagoa Nova	Rio Grande do Norte	06°05′07″	036°34′58″	WikiAves	WA2837626	P
31		—	Unspecified	Buíque	Pernambuco	08°51′08″	037°03′35″	GBIF	CMNH 7793	M
32		—	Fazenda Baixa da Quixaba	Paulo Afonso	Bahia	09°26′26″	038°04′05″	Lyra-Neves et al. 2012	—	—
33		—	Fazenda Luna	Delmiro Gouveia	Alagoas	09°29′32″	038°04′10″	Lyra-Neves et al. 2012	—	—
34		—	Parque Nacional Serra de Itabaiana	Itabaiana	Sergipe	10°41′00″	037°21′00″	Sousa 2009	—	—

occurrence records, such as those presented here and, in particular, those of rare or threatened species from poorly known regions, are fundamentally important for the understanding and conservation of biodiversity (Godoi et al. 2012).

Our new records of the 2 *Accipiter* species presented here contribute to the understanding of their distribution patterns in the Brazilian Northeast, and in particular, in the state of Maranhão. Further surveys of the avian fauna of this poorly studied region are required to cover the considerable gaps in the databases.

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Authors' Contributions

HRSM and FKU wrote the manuscript with support from AFTS and APMO; HRSM and FKU photographed the specimens; FKU and SAS were responsible for the translation into English.

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Figure 3. Records of Gray-bellied Hawk (*Accipiter poliogaster*) and Rufous-thighed Hawk (*Accipiter striatus erythronemius*) in northeastern Brazil. Red circles indicate historical records numbered as in Table 1, with the site of the present records indicated by the star.

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